Math for Assessors

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Today's Agenda

- To talk about statistics in assessment
- Statistics have three main uses:
  - Describe Data
  - Summarize Data
  - Generalize From Data
- Each of these helps make better assessments
- We will talk about each in turn

DESCRIBING DATA

Describing Data

- Statistics can ***describe*** the properties of data
- Examples:
  - Mean
  - Median
  - Coefficient of Dispersion (COD)
  - Others?

Describing Data

- Each statistic describes one property of data
- Example: Mean
  - What the average value is
- What do each of these describe?
  - Median
  - COD
  - PRD

SUMMARIZING DATA

Summarizing Data

- Statistics also ***summarize*** properties of data
- This lets us make decisions when data is ambiguous

Summarizing Data

- Example: Assessing One Property

Subject Property

Assessment: $100,000

Sale Price: $98,000

Summarizing Data

- Example: Assessing Two Properties

Subject 1

Assessment: $110,000

Sale Price: $103,000

Subject 2

Assessment: $105,000

Sale Price: $96,000

Summarizing Data

- Example: Assessing Two Properties (Part II)

Subject 1

Assessment: $106,000

Sale Price: $102,500

Subject 2

Assessment: $102,000

Sale Price: $107,000

Summarizing Data

- Are properties over-assessed?
  - One property: Easy to see
  - Two properties: More difficult (ambiguity)
  - Many properties: Often impossible
- Statistics help us make decision. . .
- . . .By **summarizing** the data.

GENERALIZING FROM DATA

Inferential Statistics

- So far, we have used statistics to
  - Describe
  - Summarize
- We can also use them to ***generalize***:
  - Learn about a ***population***. . .
  - From a ***sample***
- This is called statistical ***inference***

Inferential Statistics

- Terminology:
  - Population: The objects you are interested in
  - Sample: A smaller number of those objects
- Example:
  - Population: All brick houses in a neighborhood
  - Sample: The brick houses that sold

Inferential Statistics

- In mass appraisal, we generalize from:
  - Sample: Sold houses
  - Population: All houses
- Will just any sample do?
  - Just red houses?
  - Just newer houses?
  - Just houses with nice lawns?
- How do we know the sample is like the population?

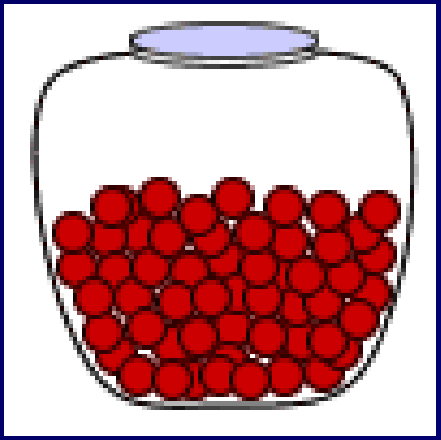
Inferential Statistics

- Can we really generalize from sold property to all property?
- Classic Statistical Answer:
  - Yes. . .
  - . . .if the sample is chosen randomly.
- Random Sample:
  - Each property has equal chance of being chosen
- Does each house have an equal chance of being sold?

Inferential Statistics

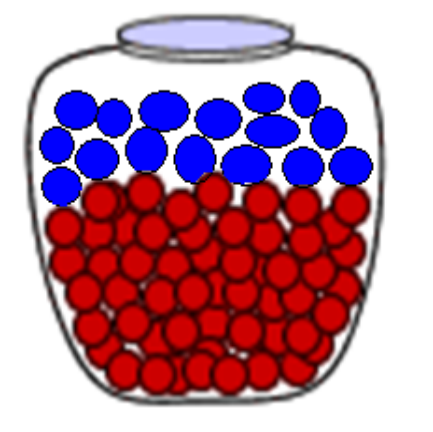
- Houses do not sell at random
- So how do we generalize from:
  - Sold houses (sample)
  - All houses (population)
- We can do this if sold houses in sample are typical of houses in population
- But how do we know this?

Inferential Statistics



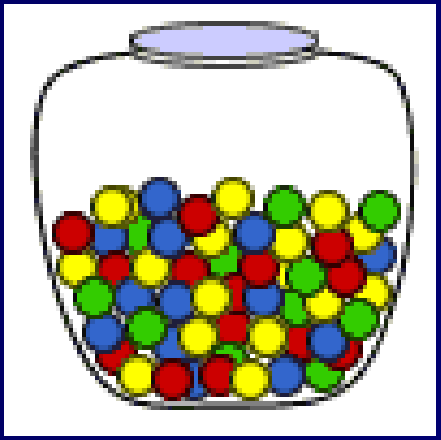
- Imagine a jar with:
  - 1,000 marbles
  - All red
- What percentage of marbles are red?
- What size sample do you need?

Inferential Statistics



- Now add:
  - 500 more marbles
  - All blue
- What percentage of marbles are red?
- What size sample do you need?

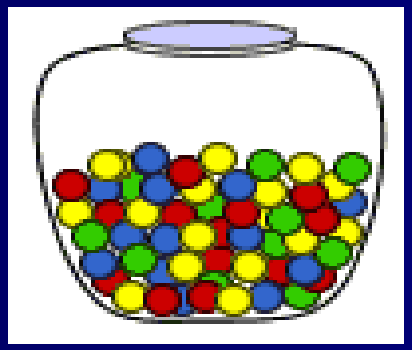
Inferential Statistics



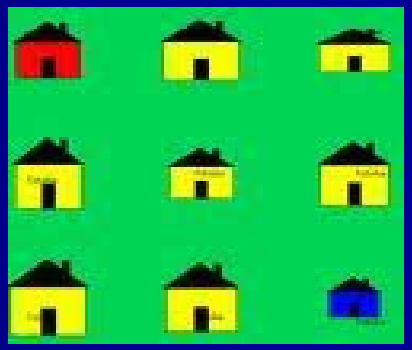
- Now lets make it interesting:
  - 1,000 marbles
  - Dozens of colors
- What percentage of marbles are red?
- What size sample do you need?

Inferential Statistics

- We need a larger sample. . .
  - When there is more **variation** in color.
- How is this like assessment?



Different Marbles



Different Houses

It’s All Too Much!

Questions?

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